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United States Patent [19]

Brink

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[54] **METHOD OF TREATING BIOMASS MATERIAL**

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Related U.S. Application Data

[60] Continuation of Ser. No. 73,780, Jun. 8, 1993, Pat. No. 5,366,558, which is a division of Ser. No. 676,836, Mar. 28, 1991, Pat. No. 5,221,357, which is a continuation of Ser. No. 58,814, Jun. 8, 1987, abandoned, which is a continuation-in-part of Ser. No. 681,435, Dec. 13, 1984, abandoned, Ser. No. 653,065, Sep. 21, 1984, Pat. No. 4,706,903, Ser. No. 324,032, Nov. 23, 1981, Pat. No. 4,384,897, and Ser. No. 23,338, Mar. 23, 1979, abandoned.

[51] **Int. Cl.**[6] **C13K 1/02**; D21B 1/16; D21C 3/16

[52] **U.S. Cl.** **127/43**; 127/37; 162/25; 162/81

[58] **Field of Search** 127/43, 37; 162/25, 162/81

[56] **References Cited**

U.S. PATENT DOCUMENTS

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[57] **ABSTRACT**

Two stage hydrolysis of lignocellulosic material, conditions during the first stage being such as to hydrolyze or depolymerize the hemicellulosic component without substantial degradation of resulting monosaccharides, conditions during the second stage being such as to hydrolyze the cellulose to glucose without substantial degradation of the glucose. The solids left after first stage hydrolysis are disintegrated mechanically thereby greatly facilitating second stage hydrolysis. Hydrolysis in both stages is preferably accomplished by the use of nitric acid. The pH retention time and temperature in both stages are selected to maximize production of the desired monosaccharide or monosaccharides.

2 Claims, 10 Drawing Sheets